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But the formula would contain nearly twice as many terms as the one here submitted, and there would be other disadvantages.

An empirical formula is valuable for purposes of interpolation; but it is utterly unreliable when used for making predictions, or extrapolations.

The following table gives a synopsis of the results of the United States Census as to population, and it is given mainly for the sake of calling attention to the last column, which affords a basis for making deductions in regard to the future growth of population.

Growth of Population

Year	Population by Census (Millions)	Population by Formula	Percentage of Increase
1790	3.9	3.9	
1800	5.3	5.3	36
1810	7.2	7.2	36
1820	9.6	9.6	33
1830	12.9	12.9	34
1840	17.1	17.1	33
1850	23.2	23.2	36
1860	31.4	31.4	35
1870	38.6	38.6	23
1880	50.2	50.2	30
1890	62.6	62.6	25
1900	76.3	76.3	22
1910	91.4 ¹	91.4	20

The last column shows that the relative increase was practically constant during the first seventy years, commenced to decline at the end of that period and has continued to do so ever since; the decline during the last fifty years having amounted to 15 per cent. The decrease is likely to be more rapid in the future than it has been in the past, since the conditions for an increase of population are not as favorable now as they were in 1860, when there was so much unoccupied land. It seems evident, therefore, that unless agricultural methods are improved and the soil made more productive, or unless people become more economical, the population of the country is likely to reach a stationary state in fifty years or less.

FRANK GILMAN

BOSTON, MASS.,
July 25, 1910

¹ Preliminary estimate.

QUOTATIONS

SALARIES OF PROFESSORS

THE question of salaries for professors is one which will always be one of the questions most alive at Cornell. The Carnegie fund for retiring aged professors has been of great help in retaining good men up to the time of retirement, but at the present time, when incomes of men in various professions and trades have advanced so rapidly, the salaries of professors have not advanced with the increased cost of living. The result is that much of the teaching has to be done by young men on small salaries who are continually looking in a natural way for opportunities to broaden their incomes and fields of usefulness. It is probable that the original intention of furthering investigation, by retiring professors at a certain time, will be found to miss this particular mark, because research work represents a type of mind quite as much as it represents opportunity. Men who have not done research work in advance of retirement are not apt to do any after retirement. Our policy of selecting noted professors from different parts of the world, as Johns Hopkins has done, accounts for a part of our rapid progress, but we have need for large incomes which will attract the men who attract students as they do at some of the older institutions of learning in other countries. We need to be able to offer salaries of at least ten thousand dollars per year for men who have proven their ability to command such salaries, no matter whether such men have developed at Ithaca, or at other institutions of learning. In making up a teaching staff of young men who are simply in line for promotion on the ground of faithful work, there is always a menace to the character of the teaching, because propinquity is one of the great powers in this world, and if it is more convenient to fill positions with men who are near at hand, and who will accept such positions on small salary, the tendency is always toward filling the teaching staff with a cumbersome number of men of merit without genius, but it is the men of genius whose names are synonymous with the names of cer-

tain universities.—From the report of Trustee Robert T. Morris, printed in the *Cornell Alumni News*.

SCIENTIFIC BOOKS

Water: Its Origin and Use. By WILLIAM COLES-FINCH, Resident Engineer to the Brompton, Chatham, Gillingham and Rochester Water Company, Kent, England. New York, D. Van Nostrand Co., Publishers. 1909. Pp. xxi + 483. \$5.

This book is not a scientific record, but written from the standpoint of an engineer professionally interested in the finding and distribution of water. Accompanying the text are numerous illustrations of mountain and glacier scenery from the original pictures of Mrs. Aubrey Le Blond (Mrs. Main), and also photographs and diagrams illustrating the engineering work of the author. Mr. Coles-Finch makes no claim to originality, but he has put together in an interesting and readable form a great deal of information on a very wide subject. A copious index adds to the value of the work.

The book opens with a discussion of solar heat, which is really the cause of water in all its forms, and the atmosphere, "without which nothing could live, nothing could burn, nothing could grow; without which no sound could be heard, and there could be no rain."

The average annual rainfall of the globe is computed to be 33 inches. In Assam from 600 to 805 inches have been recorded, while in the Sahara desert, part of Arabia, the desert of Gobi, and portions of Mexico, Chili and Peru it has seldom been known to rain. It seems to be the fact that the atmosphere of the earth is growing drier. The glaciers are retreating, the Caspian Sea and many other lakes are growing smaller, and the great deserts seem to be extending. Some of the richest countries on earth have seen their fertility decreasing, mainly owing to the ruthless destruction of their forests.

Ruined forests mean flooded rivers, periodic droughts, eroded soil and dried-up springs. . . . Many bodies having control of large tracts of land, such as water boards, are planting their catchment areas with trees with advantage and

profit; for it is found that the presence of trees adds to the retention of water falling as rain as well as by radiation and cooling the adjacent atmosphere, causing condensation and rain; it prevents floods, regulates and purifies the supply, for water from wooded areas is generally purer than that falling on bare land.

Three chapters are given to the story of snow, ice and glaciers. The different forms of ice are described, from the silver thaw or "glazed frost," which is "neither hail, hoarfrost nor snow, but rain, each drop of which solidifies as it touches any solid body," to the vast fields of ice formed in polar regions, rising to a height of 3,000 feet or more, and the glaciers, formed by the congelation and compression of the mountain snow, and which in their movement over the northern portions of Europe, Asia and America during the glacial period, mixed together the elements of different districts, disintegrated them, carried them over and deposited them on the hard chalk, rock and other foundations, covering them with rich soil well adapted for the growth of vegetation.

Having followed atmospheric water through the process of evaporation and the various forms in which it reaches the earth, the next five chapters trace its passage through the soil and rocks on its way back to the sea. On their way these streams carry material from one location to another, slowly raising new continents, and gradually but surely changing the configuration of the earth's surface by the formation of bars, estuaries, lagoon and sandbanks.

But the work of rain, rivers and waterfalls is as nothing compared with that of the sea.

The billows of the ocean agitate the loose material on the shore, wearing away the coast with endless repetitions of this act of power and imparted force; the solid portion of our earth, thus sapped to its foundations, is carried away into the deep, and sunk again at the bottom of the sea, whence it had originated, and from which, sooner or later, it will again make its appearance. (Dr. Hutton.)

The last chapters of the book are devoted to a discussion of the methods by which water is obtained and stored for domestic and mechan-